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the radiant point is stated to have been observed at or very near to the stars ζ and γ of the constellation *Leo.* The remaining twelve observed places are situated within an area bounded by a circle of less than 3° in angular diameter. The centre of the circle is in latitude +10° 27′·1, and longitude +142° 34′·9, a position 0° 24′, or less than half a degree of longitude, in advance of the longitude of "the apex of the Earth's way."

List of the Observed Places of the Radiant Point of the Meteors, 1866, *November* 13.

Ref. No.	Observer.	Place of Observation.	Position of the Radiant Point.			
			R.A.	N. Decl.	Long.	N. Lat.
			° ′	° ′	° ′	′
1	T. Crumplen	London	147 0	24 0	141 6	10 5
2	H. Macleod	London	148 57	24 18	142 41	10 58
3	F. C. Penrose	Wimbledon	148 44	22 33	143 7	9 16
4	J.F.W. Herschel	Hawkhurst	148 9	23 48	142 10	10 15
5	C. Pritchard	Freshwater	148 17	23 18	142 28	9 49
6	G. F. Burder	Clifton	150 40	22 45	144 45	10 4
7	W. H. Wood	Birmingham	148 0	25 0	141 37	11 19
8	D. Smith	Birmingham	149 12	22 37	143 31	9 28
9	E. J. Lowe	Beeston Observatory	147 17	23 15	141 36	9 27
10	S. H. Miller	Wisbeach	152 42	22 19	146 41	10 20
11	R. P. Greg	Manchester	152 18	24 6	145 40	11 52
12	J. Baxendell	Manchester	149 33	22 57·5	143 41	9 54·5
13	T.W. Backhouse	Sunderland	149 7·5	23 15	143 12	10 3
14	R. Grant	Glasgow Observatory	148 33	22 30	142 58	9 9
15	A. S. Herschel	Glasgow Observatory	149 0	24 0	142 51	10 42

References.

No. 6. The *Times,* Nov. 15th, 1866.

No. 8. The *Birmingham Daily Post,* Nov. 15th, 1866, (reprinted for private circulation.)

No. 12. *Proc. Manch. Lit. and Phil. Society,* Nov. 27th, 1866, vol. vi., p. 31.

On the Meteoric Shower of 1866, *Nov.* 13–14.

By Sir J. F. W. Herschel, Bart.

During the superb display of meteors on the night of the 13th inst. my attention was particularly directed to the determination of the exact situation in the heavens of the Radiant

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Point of their courses, which has been commonly stated to be coincident with that of the bright star γ *Leonis*. This, however, was certainly not the case; and I am enabled to say with perfect confidence that their courses diverged, with a very remarkable degree of agreement, from a point considerably higher in declination and less advanced in Right Ascension—nearly intermediate between ζ and ϵ, but a little below their line of junction, and somewhat above the place of the star marked x in Bode's Chart. Having fixed this point well in my recollection, on laying down its place on that chart next morning, I find its longitude for 1866$\frac{3}{4}$ (allowing 55′ for precession since 1801, the epoch of the chart) to be 142° 20′ and its latitude 10° 15′ north. Several circumstances enabled me to fix on this point with full assurance of its being the true Radiant: first, The frequent out-shooting from a very near proximity to it, and once in several different directions, of a volley of meteors; secondly, On two or three distinct occasions a meteor appeared in this very point, and in all these cases it was motionless, devoid of a train, and on its extinction left only a small nebulous light to mark the place of its appearance; thirdly, On one occasion a meteor shot forth horizontally at a distance of about 6 or 8 degrees from the radiant, and disappeared after running a very short course, leaving a vaporous train which continued visible (fading gradually away) for $2^{m}\ 40^{s}$, this afforded time for tracing back the direction of the train (which did not alter), and its course, continued, passed through the spot in question.

The longitude of the Earth, as seen from the Sun at midnight of the 13th, was 51° 25′, which subtracted from 142° 10′, leaves 90° 45′, whereas, were γ *Leonis* the radiant, the difference would have been 96° 10′, indicating an angle of 6° 10′ between the tangent to the Earth's orbit and that of the orbit of the meteors projected on the ecliptic, while the actual small angle so included, of 0° 45′ only, indicates a very near (*possibly* an exact) coincidence of direction. Hence we are constrained to conclude that the true line of direction in space of each meteor's flight lay in a plane at right angles to the Earth's radius vector at the moment; and that therefore, except in the improbable assumption that the meteor was at that moment *in perihelio* or *in aphelio*, its orbit would not deviate greatly from the circular form. The absolute velocity in space of the meteors would therefore be nearly that of the Earth; and from this it appears to follow of necessity that the direction of their revolution must be retrograde. Were it direct, the relative motion parallel to the ecliptic would be *nil*, and the only effective cause of apparent motion would be the meteor's resolved velocity perpendicular to the ecliptic, which would produce a radiant in the pole of the Ecliptic.

In point of fact the elevation of the radiant above the ecliptic was only 10° 15′, and as the *relative* velocity of the

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meteors in a direction parallel to the latter plane must have been twice the Earth's absolute velocity, it follows that, had the Earth stood still, the *then* apparent radiant would have had very nearly *double* that elevation (more correctly, 19° 53′), which is therefore the inclination to the Ecliptic of the meteoric orbits.

How far this conclusion of a retrograde motion of the meteorite's revolution round the Sun,—a conclusion already, I believe, arrived at by Mr. Newton, is compatible with the truth of the "Nebular hypothesis," we may leave it to the advocates of that hypothesis to consider.

I have mentioned the case of one of the meteors leaving a train visible during $2^{m}\ 40^{s}$. A much more striking instance occurred in the case of one which exploded close to the three bright stars in *Aries*. The train left at first was very bright, and very nearly parallel to the line joining α and β. It remained visible for no less than 6 minutes, during which time *it drifted slowly to the southwards over a space of* 8 *or* 9 *degrees, and at the same time gradually changed its direction, so that just before its disappearance it was at right angles to its original position.*

Collingwood, Nov. 15, 1866.

Inference from the observed Movement of the Meteors in the appearance of 1866, *November* 13–14. By G. B. Airy, Esq., Astronomer Royal.

It is established by abundant evidence that the meteors seen in the late magnificent display diverged, for the most part, with singular accuracy, from a point which may thus be described: join γ *Leonis* and ε *Leonis* by an arc of a circle, the Centre of Divergence was about a degree north of the middle of the arc. There were other centres of partial radiations, but this may be accepted as the centre of radiation of the general mass.

This was the case all through the night; in fact, the first exact determination of the point which reached me was from my son Mr. Hubert Airy, who had occasion to walk several miles between five and six o'clock in the morning of the 14th (Nov. 13, 17^{h} to 18^{h}), and carefully observed a considerable number of meteors, the intersection of whose paths he determined accurately; subsequently I received the chart of Mr. Alexander Herschel, made several hours earlier, and observations of other persons at different hours; and all agreed in fixing on the point which I have specified as the centre of divergence.